(No Model.) 3 Sheets—Sheet 1.

R. L. FROST.

CONDENSER FOR STEAM PUMPS.

No. 429,808. Patented June 10, 1890.

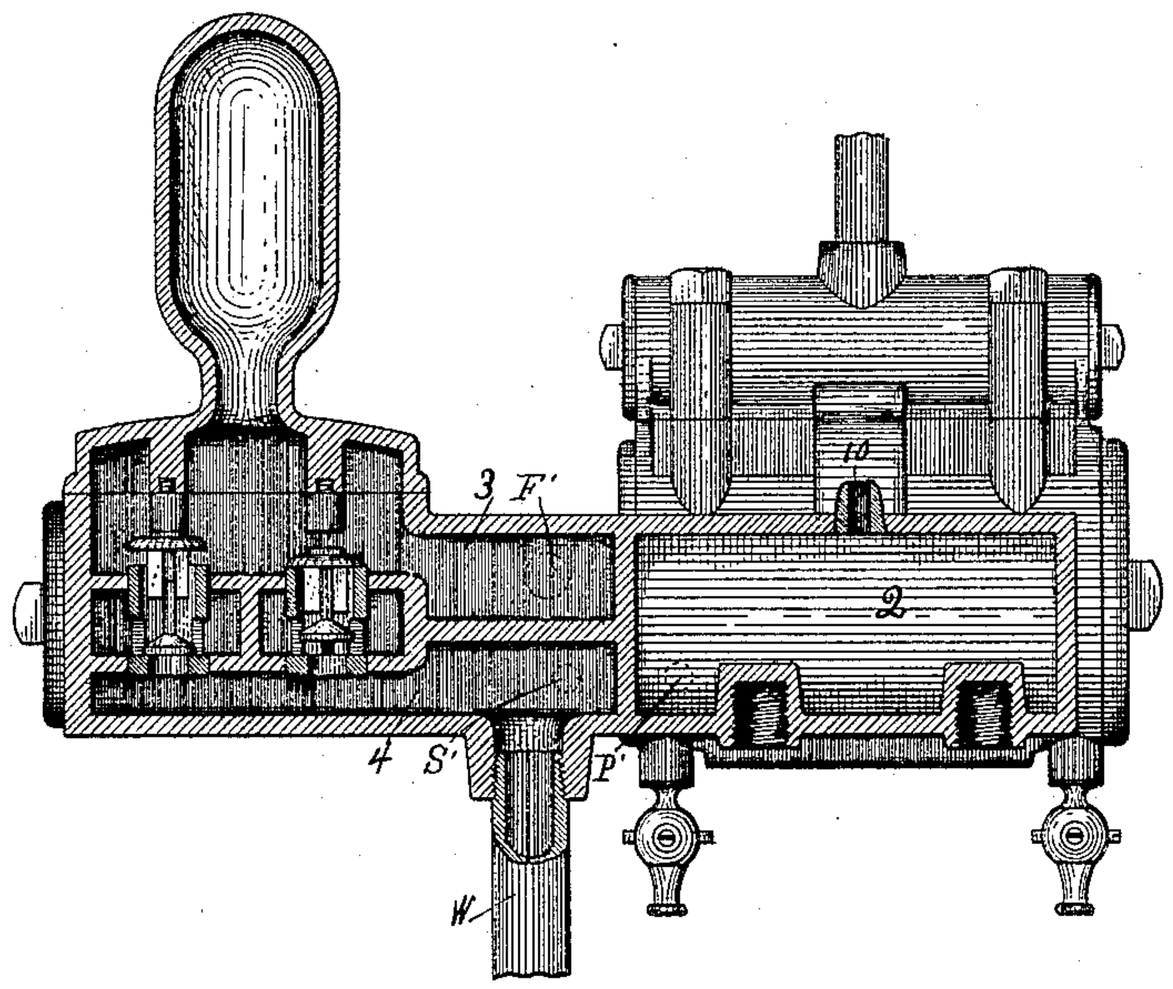

Fig. 1

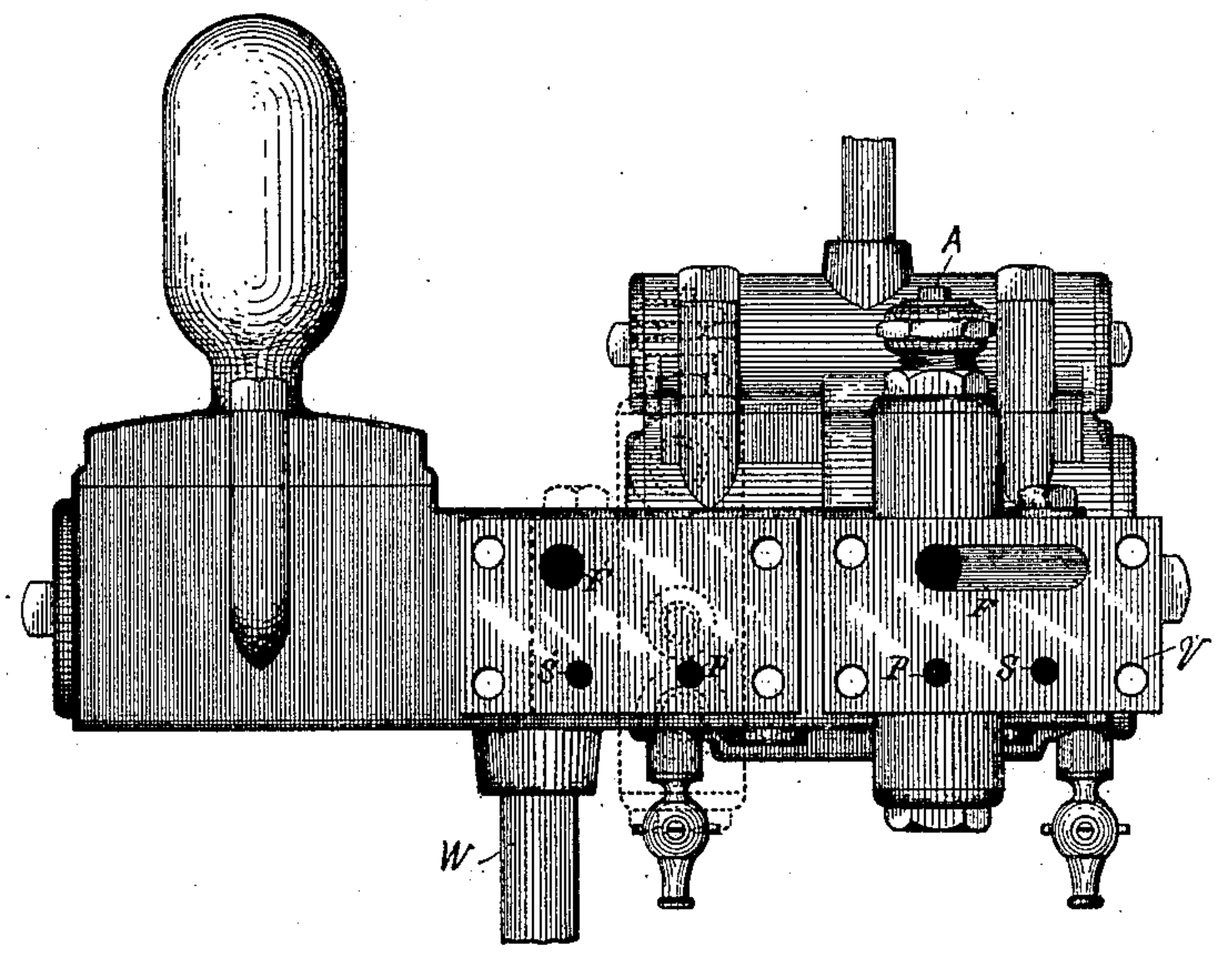

Fig. 2

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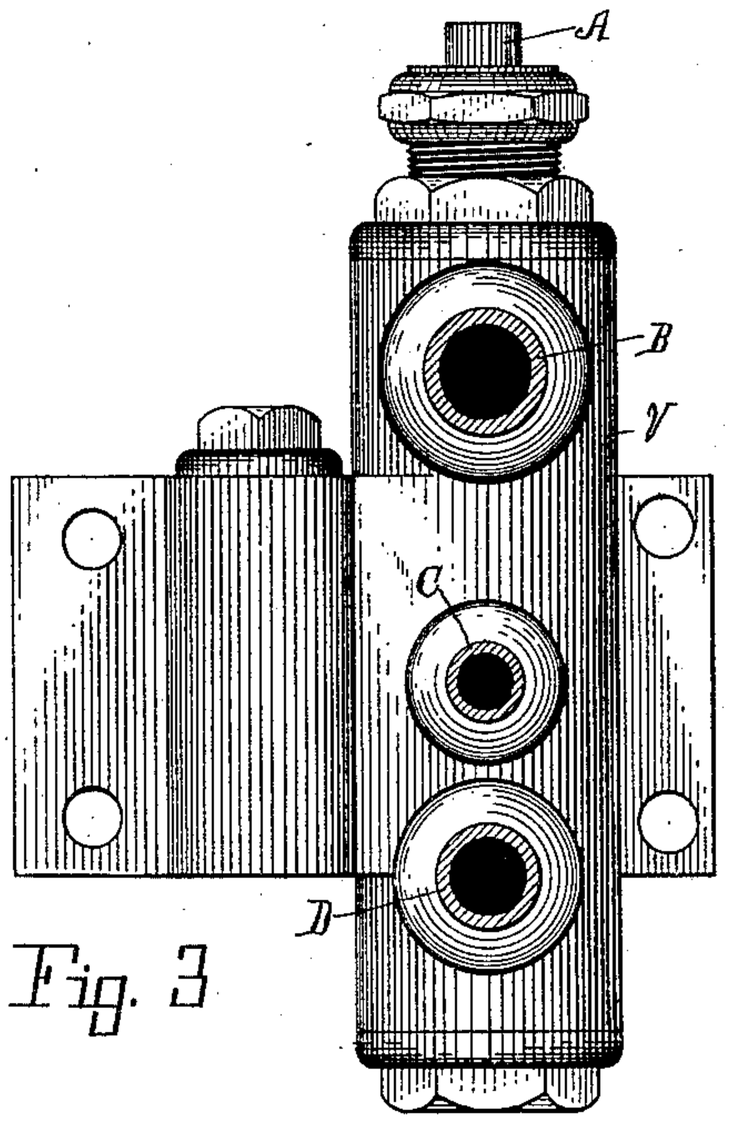

Fig. 3

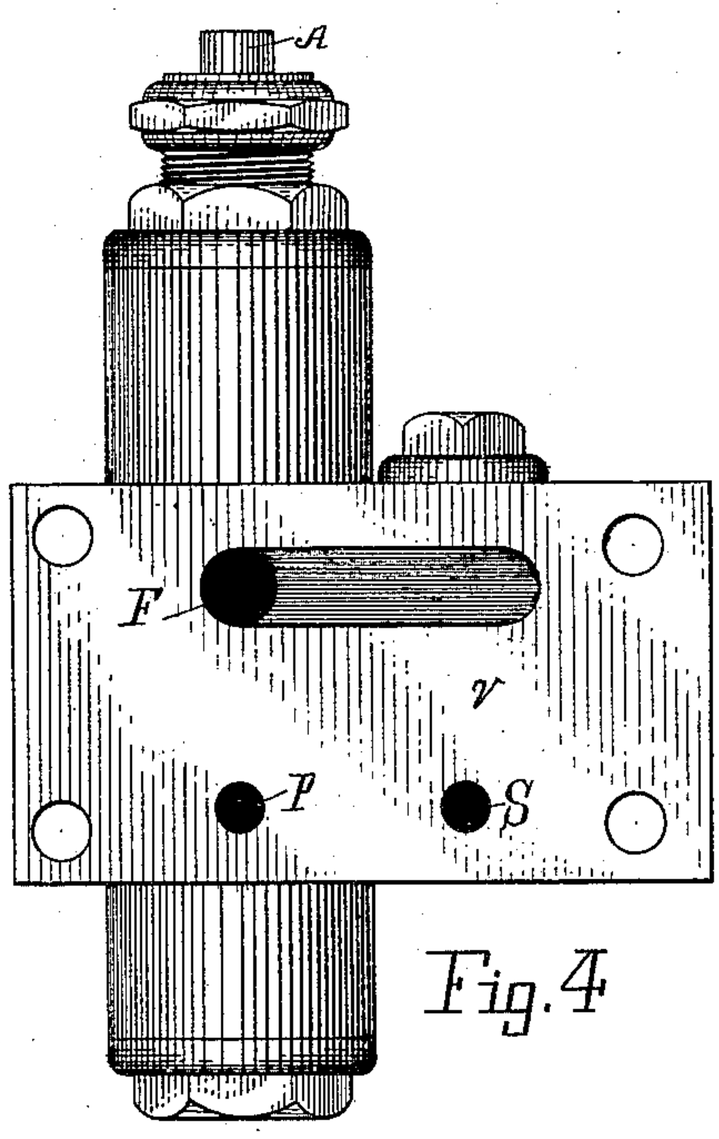

Fig. 4

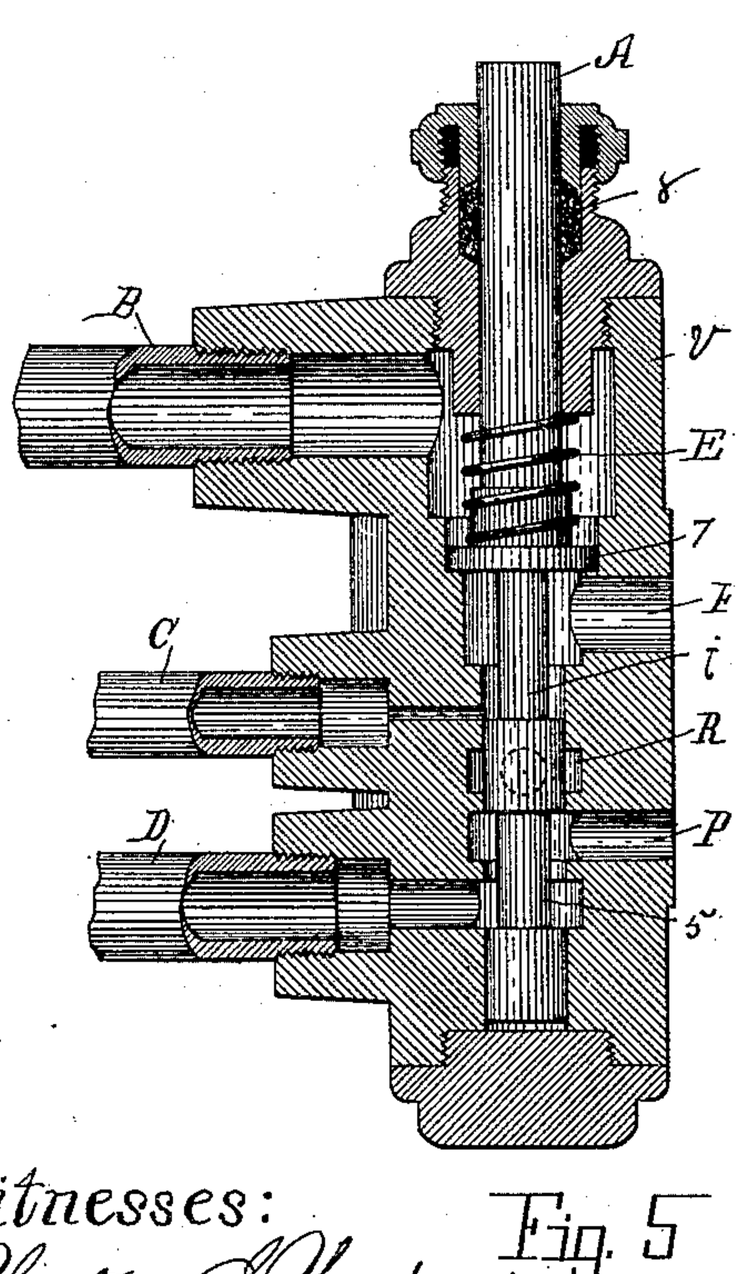

Fig. 5

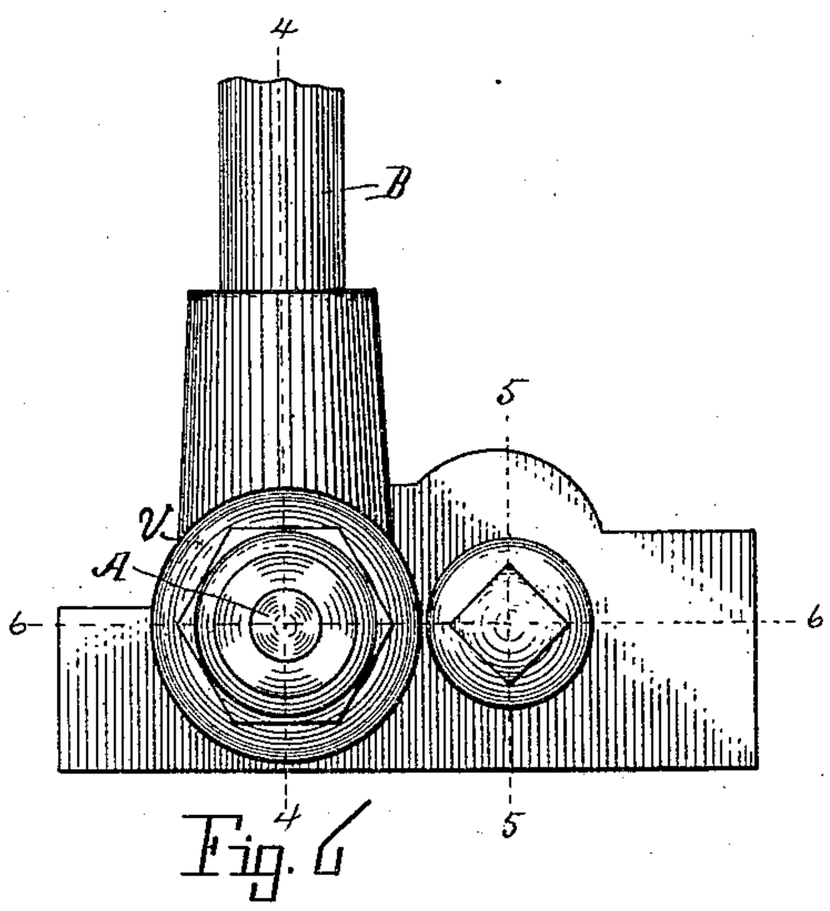

Fig. 6

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CONDENSER FOR STEAM PUMPS.

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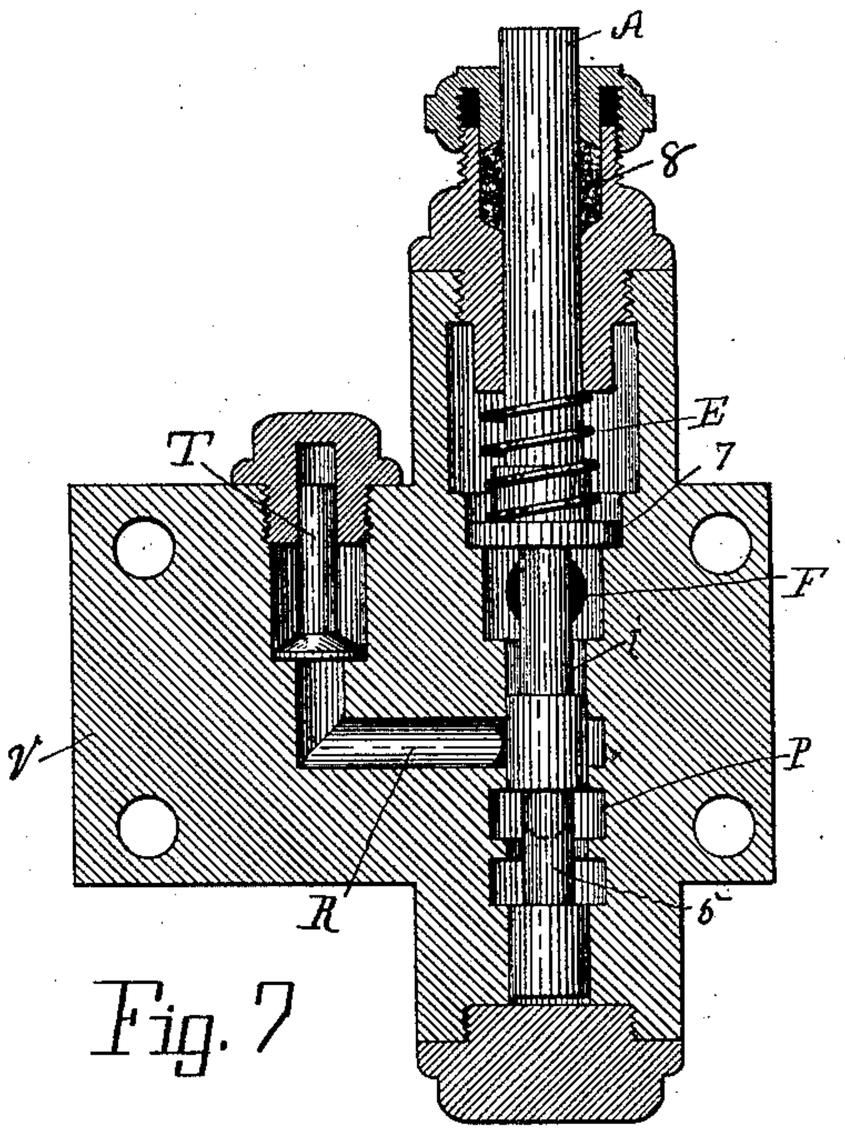

Fig. 7

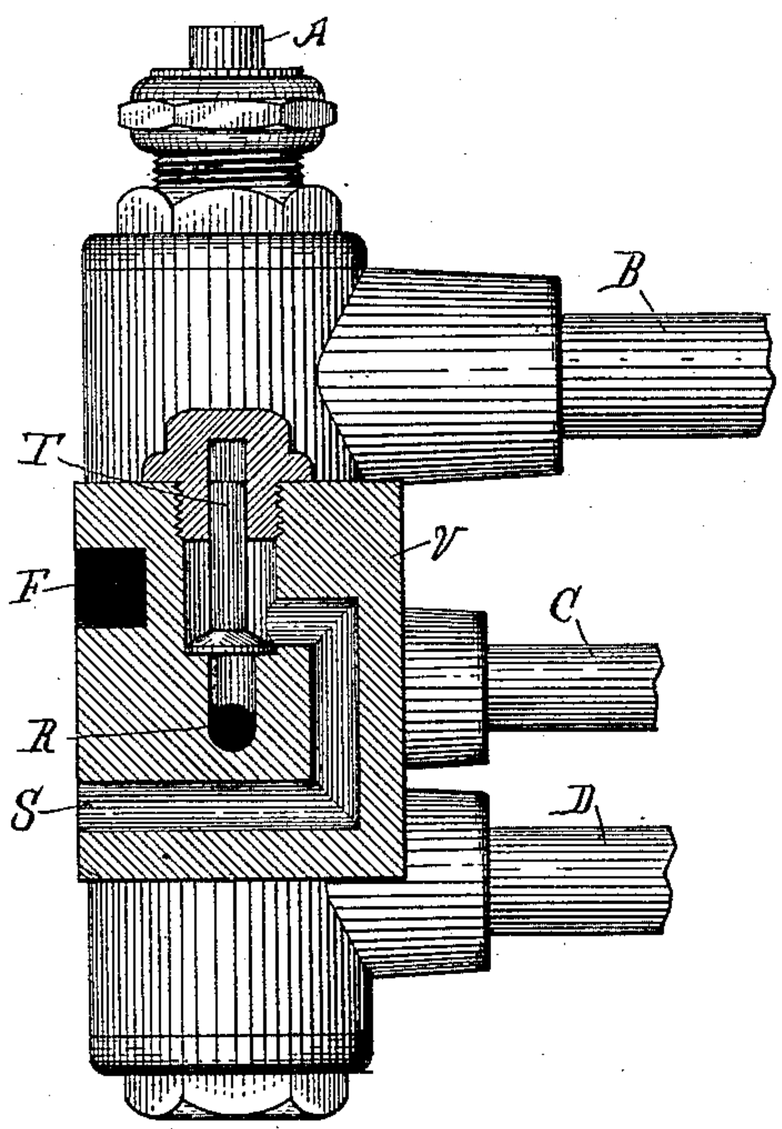

Fig. 9

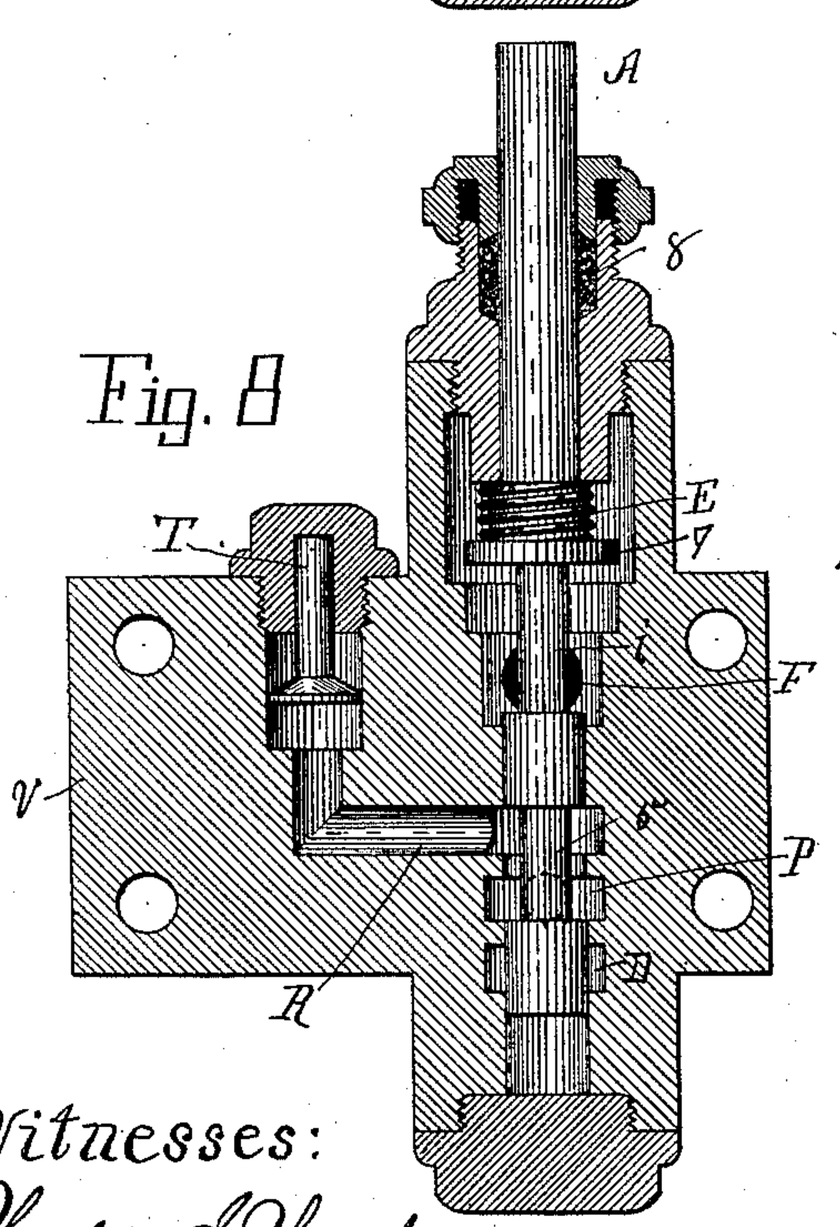

Fig. 8

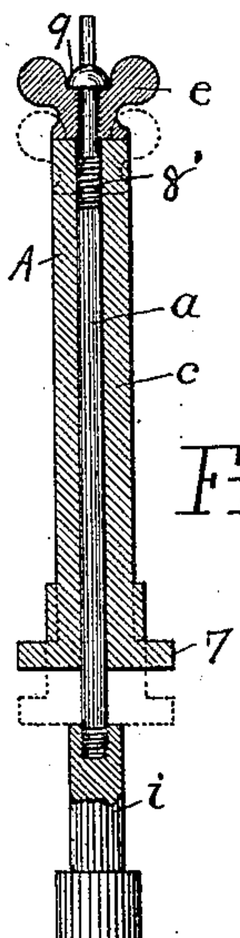

Fig. 10

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UNITED STATES PATENT OFFICE.

RICHARD L. FROST, OF BATTLE CREEK, MICHIGAN, ASSIGNOR TO THE UNION MANUFACTURING COMPANY, OF SAME PLACE.

CONDENSER FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 429,808, dated June 10, 1890.

Application filed December 2, 1889. Serial No. 332,345. (No model.)

To all whom it may concern:

Be it known that I, RICHARD L. FROST, a citizen of the United States, residing at Battle Creek, county of Calhoun, State of Michigan, have invented a new and useful Condenser for Steam-Pumps, of which the following is a specification.

This invention relates to condensers for steam-pumps, from which condenser suitable ports communicate with an exhaust-chamber, water-supply chamber, and water-delivery chamber of the pump and with the open air.

The main object of this invention consists in the construction of a condenser in which a valve is employed, which is automatically operated by the water flowing through said condenser, whereby among other points of utility no manual action of the engineer is necessary to govern said condenser, and said engineer is enabled to know whether or not the pump is performing its normal function, as will be more clearly explained below.

In the drawings forming a part of this specification, Figure 1 is a sectional elevation of the pump. Fig. 2 is an elevation of the pump with the condenser removed and turned back against the pump, showing the surface of the condenser which fits against the pump when said pump and condenser are attached together in operative condition. Fig. 3 is an elevation of the condenser, showing the reverse side of Fig. 4. Fig. 4 is an elevation showing the reverse side of Fig. 3. Fig. 5 is a vertical section of the condenser, taken on line 4 4 in Fig. 6. Fig. 6 is a plan view of Fig. 4. Fig. 7 is a section taken on line 6 6 in Fig. 6, looking from a point above. Fig. 8 is the same, illustrating the operation of the valve. Fig. 9 is a section taken on line 5 5 in Fig. 6, looking from a point at the right; and Fig. 10 is an elevation of a modified construction of the valve, parts being in longitudinal section, said valve being more particularly described below.

Referring to the drawings, Fig. 1 shows a steam-pump, substantially of the ordinary construction, having the exhaust-chamber 2, the water-supply chamber 4, the water-delivery chamber 3, and water-supply pipe W.

In Fig. 2 is shown the condenser *v* detached and turned back, disclosing the port-openings, which register with like port-openings in the pump, as will hereinafter appear. The port-opening F of the condenser registers with the port-opening F′ of the pump, and port-opening P of the former registers with the port-opening P′ of the latter, and the port-opening S of said condenser registers with the port-opening S′ of said pump. The dotted ports F′, S′, and P′ in Fig. 1 merely indicate the position of the ports pointed out by like ports F′, S′, and P′ in Fig. 2.

The condenser is illustrated by various views in Figs. 3, 4, 5, 6, 7, 8, and 9.

The condenser is internally chambered, and in said chamber is placed the automatic valve A. This valve has an enlarged head 7, which checks the backwater from the boiler through pipe B, Fig. 5, and an annular port *i*, through which the water flows from the induction water-port F to the delivery-chamber 3 of the pump, Fig. 1, said induction-port being also shown in Figs. 2, 4, 7, 8, and 9 by F, and at the point of entrance into the water-delivery chamber in Fig. 1 at F′, as hereinbefore stated. Said annular port *i* also registers with the air-escape port through pipe C into the open air, for the purpose hereinafter described. Said valve A also has an annular port 5, through which the exhaust-steam passes from port P on through pipe D into the open air, as shown in Fig. 5, when the pump is not supplying water into the boiler through port F from port F′ in Figs. 1 and 2, and when the valve A is raised, as in Fig. 8, and the boiler is being supplied with water, the exhaust-steam passes through port R and past the check-valve T and on through the passage S, Figs. 7 and 9, and on into the water-supply chamber 4 through port S′, Figs. 1 and 2, where said steam is condensed. Returning to Fig. 8, the valve A is shown in the position it occupies when the inflowing water from the delivery-chamber 3 has overcome the pressure of the backwater upon the upper surface of the valve-head 7. When the inflowing water has overcome said pressure upon the valve-head, the water flows on past said head and through pipe B and supplies the boiler. The valve thus rises and falls and fluctuates between the extreme lower and upper limits of its movements, according to the relative

relation of the pressure of the inflowing water as compared with the pressure of the backwater from the boiler against the head 7 of the valve A. By this arrangement it will be observed that when the pump is supplying water to the boiler and the valve is raised, as in Fig. 8, there is no exhaust of steam through pipe D into the open air, because the valve, after having been raised, closes the port leading into said pipe D. Hence the engineer knows that the pump is performing its normal functions. On the other hand, referring to Fig. 5, in which the valve A is not raised, and hence no water is passing into the boiler, and the steam is exhausting through pipe D, the engineer will know by this condition of facts that the pump is not working.

In some constructions the valve A might find its normal position when the pump is at rest or before the inflowing water has raised the valve by gravity; but, owing to the friction of the stuffing-box 8 against the upper stem of the valve A in perhaps the majority of cases, a spring E, having a downward pressure on the valve, would be necessary. I have illustrated said spring in Figs. 5, 7, and 8.

Referring to Fig. 5, the port leading through pipe C from the interior of the condenser V into the open air is to allow an escape of the air which would be forced into the condenser beneath the valve-head 7 by the pump. If this accumulation of air did not escape, it would retard or at least disturb the desired flow of the water through port F into the condenser from the water-supply chamber 3, and thus prevent a prompt and successful operation of the pump.

In Fig. 10 is shown a modification of the valve A. The stem of the valve and the head 7 are integral with each other and separate from the lower part of the valve, and said stem is provided with a longitudinal hole, through which loosely passes the rod *a*, said rod being attached to said lower part of the valve. The rod *a* has a threaded portion 8′ near the upper end, and above said threaded portion is a shoulder 9, and between said shoulder and the upper end of the valve-stem is an internally-threaded thumb-screw *e*, loose on said rod *a*. The dotted portion of the stem and head shown in Fig. 10 shows the valve in the condition shown in Fig. 5, and the two parts of the valve are rigidly held in said condition by the engagement of the internal threads of the thumb-screw *e* with the exterior threads 8 of the rod *a*. By disengaging said thumb-screw from the threads 8 of the rod *a* the upper portion of the valve will be raised by the water without any movement of the lower portion of the valve. The object of this is to allow a rise of the valve-head, in order to permit a flow of the water into the boiler, while the exhaust-portage of the steam into the air is left open. One of the necessities for this which might occur is that the exhaustion of steam might be too great in proportion to the amount of water entering the supply-chamber 4 of the pump, said adjustment of the valve being made by the engineer whenever the occasion demands.

While the pump shown in Fig. 1 is described as having a steam-exhaust chamber 2, and my condenser is, as shown, adapted to coact with the pump having said chamber, it will appear obvious that my condenser may be used with a pump in which no such chamber appears, in which case the exhaust-steam would pass directly from the exhaust-port 10 of the pump, Fig. 1, into the exhaust-port P of the condenser.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The condenser, in combination with a steam-pump, said condenser and pump having suitable communicating water-ports and steam-ports, and an automatic valve in said condenser constructed to coact with said ports, all in the manner and for the objects substantially as set forth.

2. The combination, with a steam-pump having a water-supply chamber, a water-delivery chamber, and an exhaust-steam chamber, of a condenser, suitable water-ports and steam-ports communicating with said condenser and pump, and a valve in said condenser provided with annular ports and adapted to be automatically operated by the inflowing water, substantially as set forth.

3. The combination of a steam-pump, a condenser, suitable water-ports and steam-ports communicating with said pump and condenser, the valve in said condenser automatically operated by the action of the water, and a spring forming a resistance against the rise of said valve, substantially as set forth.

4. The combination of a steam water-pump, said pump having a water-supply chamber and a water-delivery chamber, and a condenser, said condenser having a steam-exhaust port into the open air and a steam-exhaust port leading from the water-supply chamber, a water-supply port leading from the water-delivery chamber through the water-supply pipe into the boiler, and a valve in said condenser having annular ports coacting with said water-ports and steam-ports and adapted to be automatically operated by the water flowing through the condenser, substantially as set forth.

5. A condenser for steam-pumps employing a valve automatically operated by the action of the water flowing through the condenser, said condenser being provided with an air-escape port, in combination with the water-supply-port, substantially as set forth.

In testimony of the foregoing I have hereunto subscribed my name in presence of two witnesses.

RICHARD L. FROST.

Witnesses:
NELSON E. HUBBARD,
HENRY H. HUBBARD.